

Application No. 09/862,593
Docket No.: Shipley 03-16 (ACT - 135)

Art Unit: 1756
Examiner: Sagar, Kripa

Please amend the application, without prejudice, as follows:

In the Specification:

Please amend the specification to read as follows. A marked-up copy of the specification changes is provided in the Attachment.

1. Please amend paragraph [0150] to read as follows. The change is made to effect minor clerical revisions. No new matter is added.

[0150] The structure of FIG. 1(i) is then subjected to a wet etch to obtain the structure of FIG. 1(j) in which inclined surface features 109 are formed at opposite sides of the silicon substrate 101. Note that the inclined surface features 109 are defined here by the same mask pattern that was previously used to define the waveguide portions 105a of the core material layer. Also note that the inclined surface features 109 may actually define half of a V-shaped groove in the case where another device is being simultaneously formed in the substrate 101 adjacent to the device illustrated in the drawings.

2. Please amend paragraph [0165] to read as follows. The change is made to delete reference to non-existent Fig. 3(n) and to effect a minor clerical revision. No new matter is added.

[0165] Another illustrative embodiment of the present invention will now be described with reference to the top views of FIGs. 2(a) through 2(i) and the side views of FIG. 3(a) through 3(m). Throughout these figures, like elements are designated by the same reference numbers. In this embodiment, a generally V-shaped groove (micro-machined feature) is aligned with an integrated optical waveguide core(s).

3. Please amend paragraph [0220] to read as follows. The change is made to conform the specification with the contents of Fig. 7(b). No new matter is added.

[0220] Turning to FIG. 7(b), a mask 790 is formed over the core material layer 705 and the mask pattern 706a so as to have an opening aligned with the lower cladding layer 704. The exposed portions of the core material layer 705 are then removed by RIE and the mask 790 is removed to obtain the structure depicted in FIG. 7(c). Here, reference number 705b denotes the waveguide portions of the core material layer remaining after etching.

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4. Please amend paragraph [0225] to read as follows. The changes are made to correct a minor grammatical error and to further describe Fig. 7(e). Support for the changes are found at least in Fig. 7(e) and page 12/15 of US Provisional Application 60/206,485 which is incorporated by reference in the subject application. Thus, no new matter is added.

[0225] The portions 706b of the first mask are then removed, and an upper cladding layer 707 is deposited as shown in FIG. 7(d). A mask 710 is applied over the upper cladding layer 707 as shown in FIG. 7(e) and this structure is then subjected to an etch process (e.g., wet etching or RIE) to remove portions of the upper cladding layer 707 not covered by the mask 710 to thereby define the machined features as shown in FIG. 7(e). The process then proceeds as in the first described embodiment (see FIG. 1 (i)). One advantage of the present embodiment is that the machined features can be more accurate since the core layer defining the machined features is etched only once.

5. Please amend paragraph [0245] to read as follows. The change is made to recite that the core layer in Fig. 8(c) is referenced by numeral "805" not "105". Support for the change is found at least in Fig. 8(c) and the first sentence of paragraph [0245]. A minor grammatical change is also made. No new matter is added.

[0245] Turning to FIG. 8(c), a core material layer 805 is deposited over the surface of the cladding material layer 804. In this embodiment, the core material layer 805 is formed of silica. However, other materials may be used, including but not limited to silicon and silicon nitride. The structure of FIG. 8(c) is then planarized to obtain the structure of FIG. 8(d). As shown, both the core material layer 805 and the cladding layer material 804 are contained within the pit 802, and the remaining surface of the substrate 801 is exposed.

6. Please amend paragraph [0260] to read as follows. The change is made to delete reference to "underlying etched feature portions 805a" which are not present in Fig. 8(h). No new matter is added.

[0260] Turning to FIG. 8(h), a mask 808 is deposited over the cladding material layer 807 so as to cover the waveguide portions 805b and partially overlap the mask layer portions 806a. Another etch process (e.g., wet etching or RIE) is then performed down to the silicon

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substrate 801 to obtain the structure illustrated in FIG. 8(i). As shown, the mask layer portions 806a remain on the surface of the silicon substrate 801.

7. Please amend paragraph [0275] to read as follows. The changes are made to correct a minor grammatical error and to replace reference numerals 106a/106b, which are not used in Figs. 8(a)-8(l), with 806a/806b which are used. Support for the change may be found, for example, at least in paragraph [0250]. No new matter is added.

[0275] As with the previous embodiments, the horizontal distance between the waveguide cores 805a and the inclined surface feature 809 is precisely set since the same mask pattern 806a/806b is used to etch both the waveguide 805a and the feature 809, and the device characteristics and alignment tolerances are thereby improved.

In the drawings:

Please amend Fig. 1(m) as marked in red on the copy attached hereto. Reference numeral "105a" is changed to "105b" to comport with the use of "105b" in Figs. 1(g), 1(h), and 1(k) and the use in the last sentence of paragraph [0155]. The reference distance "D" is added per the Examiner's suggestion.

Please amend Figs. 2(h), 2(i), 3(k), and 3(m) as marked in red on the copy attached hereto to include reference numeral "214" as requested by the Examiner.

Please amend Fig. 3(b) as marked in red on the copy attached hereto to delete the unused lead lines as requested by the Examiner.

Please amend Figs. 3(c) and 3(d) as marked in red on the copy attached hereto. Reference numerals "205a" and "205b" are changed to "205b" and "205a", respectively, to comport with the usage in the text at paragraph [0175]. In Fig. 3(d) the reference numeral "206b" is changed to "206a" to comport with the usage in Fig. 3(c).

Please amend Fig. 4 as marked in red on the copy attached hereto to include the sectioning line "10-10'". The change is made to comport with the specification at paragraph [0200] and with Fig. 5(b).

Please amend Figs. 7(d) and 7(e) as marked in red on the copy attached hereto to include the reference numerals for the layers, as requested by the Examiner.